

### **Amendments to the Claims**

Please **cancel claims 1-62** without prejudice.

Please **add claims 63-111** as follows:

63. (New) A method of treating water or wastewater in a system including a reactor, a vertical flow channel disposed in the reactor, and a separator, comprising:
- a. adding a flocculant to the water or wastewater;
  - b. directing the water or wastewater into an open upper end of the flow channel immersed in the water or wastewater in the reactor, down through the flow channel, out a lower end of the flow channel and upwardly outside of the flow channel and through the reactor;
  - c. mixing the flocculant and water or wastewater as the water or wastewater passes downwardly through the flow channel and wherein the mixing of the flocculant with the water or wastewater forms a flocculated mixture including flocs; and
  - d. directing at least some of the flocculated mixture to the separator and separating clarified effluent from sludge which contains the flocs.
64. (New) The method of claim 63 including continuously recirculating the flocculated mixture from the reactor downwardly through the immersed flow channel.
65. (New) The method of claim 63 wherein an agitator is disposed in the flow channel, and the method includes agitating the water or wastewater in the flow channel so as to give rise to an axial downward flow of the water or wastewater.

66. (New) The method of claim 63 including dividing the flow of the water or wastewater being discharged from the lower end of the flow channel.
67. (New) The method of claim 63 including continuously recirculating the water or wastewater by directing the water or wastewater into the upper open end of the flow channel, downwardly through the flow channel, out the lower end of the flow channel, upwardly outside of the flow channel and through the reactor, and back into the open upper end of the flow channel.
68. (New) The method of claim 63 including directing an inlet flow of water or wastewater into the reactor and maintaining a flow rate through the flow channel greater than the flow rate of inlet water or wastewater.
69. (New) The method of claim 63 including agitating the water or wastewater passing through the flow channel, and wherein the agitation within the flow channel is more intense than agitation occurring outside the flow channel.
70. (New) The method of claim 63 wherein the flow channel is disposed generally centrally within the reactor, and wherein the reactor includes an inlet and outlet disposed such that substantial portions of the water or wastewater to be treated is required to be passed through the general central area of the reactor.
71. (New) The method of claim 63 including agitating the water or wastewater at generally a mid height in the flow channel resulting in a downward turbulent axial flow in the flow channel.
72. (New) The method of claim 63 including dividing the flow of the flocculated mixture being discharged from the lower end of the flow channel.

73. (New) The method of claim 72 including positioning a flow divider adjacent the outlet end of the flow channel for dividing the flow of the flocculated mixture.
74. (New) The method of claim 63 wherein the reactor includes a surrounding wall structure, and the flow channel is disposed inwardly and in spaced apart relationship to at least a substantial portion of the surrounding wall structure of the reactor, and wherein the bottom of the flow channel is located from the bottom of the reactor a distance of approximately  $1/3$  to  $2/3$  of the average width of the flow channel.
75. (New) The method of claim 74 wherein the top of the flow channel is located a distance of approximately  $1/3$  to  $2/3$  of the average width of the flow channel from the surface of the water or wastewater in the reactor.
76. (New) The method of claim 63 wherein the flow channel is disposed generally centrally within the reactor, and wherein the reactor includes an inlet and outlet disposed with respect to each other so as to generally require the water or wastewater to be treated to move over the flow channel during the course of treatment.
77. (New) The method of claim 63 wherein the flocculating agent is introduced upstream of the reactor or is introduced into the reactor.
78. (New) The method of claim 77 wherein the flocculant is introduced between an inlet to the reactor and the open upper end of the flow channel.
79. (New) The method of claim 63 including introducing the flocculant into a central area of the reactor.
80. (New) The method of claim 63 wherein at least a portion of the flocculant is injected into the reactor generally coaxially with the flow channel.

81. (New) The method of claim 63 including mixing an insoluble granular material with the water or wastewater.
82. (New) The method of claim 63 including mixing a coagulant with the water or wastewater to be treated.
83. (New) The method of claim 81 including mixing the coagulant with the water or wastewater to be treated.
84. (New) The method of claim 63 wherein the separator comprises a sedimentation tank and wherein the flocs of the flocculated mixture settle in the sedimentation tank.
85. (New) The method of claim 63 including agitating the water or wastewater with an agitator in the flow channel to cause the flow to move axially down through the flow channel, and engaging the downward flowing water or wastewater with a flow divider and dividing the flow after which the water or wastewater moves upwardly in the reactor and outside of the flow channel.
86. (New) The method of claim 85 wherein agitation in the flow channel causes the water or wastewater to be relatively more turbulent in the flow channel than outside the flow channel.
87. (New) The method of claim 63 wherein the flow channel is an elongated conduit having a wall structure that constrains the water or wastewater entering the open top thereof to move downwardly through the entire conduit and to be discharged out the lower open end thereof.
88. (New) The method of claim 63 including an agitator disposed in the flow channel between the upper and lower ends and agitating the water or wastewater as the water or wastewater flows downwardly through the flow channel such that the flow of the

water or wastewater through the flow channel is relatively more turbulent than the flow of water or wastewater outside of the flow channel; engaging the water or wastewater in the vicinity of the lower end of the flow channel with a structure that causes the flow of water or wastewater leaving the flow channel and moving upwardly in the reactor to be less turbulent than in the flow channel; and recirculating the water or wastewater from the reactor into and downwardly through the flow channel.

89. (New) A water or wastewater treatment system for treating water or wastewater by mixing a reagent with the water or wastewater, the water or wastewater treatment system comprising:

- a. a reactor having a bottom, an inlet, and an outlet;
- b. a flow channel adapted to be immersed within the water or wastewater in the reactor, and generally vertically disposed in the reactor, the flow channel having an open upper end and an open lower end and a surrounding wall structure that permits water or wastewater to enter the open upper end and to flow downwardly through the flow channel and be discharged out the open lower end thereof;
- c. the lower end of the flow channel being spaced from the bottom of the reactor;
- d. an agitator disposed in the flow channel generally between the open upper and lower ends for mixing the reagent with the water or wastewater and for inducing water or wastewater from the reactor into the open upper end, and moving the water or wastewater downwardly through the flow channel to where the water or wastewater is discharged therefrom; and

- e. a structure disposed in the vicinity of the lower end of the flow channel for engaging the water or wastewater and causing the flow of the water or wastewater leaving the flow channel and moving upwardly in the reactor to be less turbulent than the water or wastewater in the vicinity of the agitator in the flow channel.
90. (New) The water or wastewater treatment system of claim 89 wherein the flow channel comprises a tube.
91. (New) The water or wastewater treatment system of claim 90 wherein the flow channel has a generally constant width throughout a substantial section of the length of the flow channel.
92. (New) The water or wastewater treatment system of claim 89 wherein the agitator is disposed generally midway between the upper and lower ends thereof.
93. (New) The water or wastewater treatment system of claim 89 wherein the flow channel has a diameter of approximately 102% to 120% of the diameter of the agitator.
94. (New) The water or wastewater treatment system of claim 89 wherein the flow channel delineates a central area from a peripheral area in the reactor, and wherein the width of the central area forms approximately 40% to 60% of the average width of the combined area of the central area and peripheral area.
95. (New) The water or wastewater treatment system of claim 89 wherein the structure disposed in the vicinity of the lower end of the flow channel is a flow divider that divides the flow of water or wastewater being discharged from the flow channel.

96. (New) The water or wastewater treatment system of claim 89 wherein the lower end of the flow channel is spaced from the bottom of the reactor a distance of approximately  $1/3$  to  $2/3$  of the diameter of the flow channel.
97. (New) The water or wastewater treatment system of claim of claim 89 wherein the upper open end of the flow channel is adapted to be spaced from the surface of the water or wastewater contained in the reactor a distance of approximately  $1/3$  to  $2/3$  of the diameter of the flow channel.
98. (New) The water or wastewater treatment system of claim 89 wherein the distance between the bottom of the reactor and the lower end of the flow channel, and the distance between the upper end of the flow channel and the surface of the water or wastewater contained in the reactor is at least approximately 50% of the diameter of the flow channel.
99. (New) The water or wastewater treatment system of claim 95 wherein the flow divider includes a height equal to approximately at least  $2/3$  of the distance between the lower end of the flow channel and the bottom of the reactor.
100. (New) The water or wastewater treatment system of claim 95 wherein the flow divider includes a cruciform baffle including a series of vertical walls, and wherein the horizontal distance of respective vertical walls is approximately  $3/4$  to  $5/4$  of the radius of the flow channel, which assumes a cylindrical configuration.
101. (New) The water or wastewater treatment system of claim 95 wherein the flow divider includes a series of baffles.
102. (New) The water or wastewater treatment system of claim 89 including a transverse plate facing the inlet and a transverse plate facing the outlet.

103. (New) The water or wastewater treatment system of claim 89 including a reagent injector connected to a supply of a reagent for injecting a reagent into the water or wastewater to be treated.

104. (New) The water or wastewater treatment system of claim 103 wherein the reagent injector is disposed with respect to the inlet and the flow channel to inject a reagent between the inlet and the upper open end of the flow channel.

105. (New) The water or wastewater treatment system of claim 89 including a separator operatively associated with the reactor for receiving water or wastewater from the reactor and separating solids from the water or wastewater.

106. (New) The water or wastewater treatment system of claim 89 including an injector for injecting insoluble granular material into the water or wastewater in the reactor.

107. (New) A method of treating water or wastewater in a system including a reactor and a vertical flow channel disposed in the reactor, comprising:

- a. adding a reagent to the water or wastewater;
- b. directing the water or wastewater into an open upper end of the flow channel immersed in the water or wastewater in the reactor and moving the water or wastewater downwardly through the flow channel, out the lower end of the flow channel, and upwardly outside the flow channel and through the reactor;
- c. as the water or wastewater moves downwardly through the flow channel, mixing the reagent with the water or wastewater; and



- d. wherein an agitator is disposed in the flow channel between the upper and lower ends thereof, and the method includes driving the agitator and causing water or wastewater from the reactor to be induced into the open upper end of the flow channel and to be moved downwardly therethrough such that the water or wastewater is mixed with the reagent as the water or wastewater moves downwardly through the flow channel.
108. (New) The method of claim 107 including a flow divider disposed in the vicinity of the lower end of the flow channel and wherein the method includes dividing the flow of water or wastewater being discharged from the lower end of the flow channel.
109. (New) The method of claim 107 wherein the agitator causes the water or wastewater passing downwardly through the flow channel to be at least slightly turbulent, and wherein the method entails engaging the water or wastewater being discharged from the flow channel so as to cause the water or wastewater moving upwardly through the reactor and outside of the flow channel to be less turbulent than the flow of water or wastewater through the flow channel.
110. (New) The method of claim 109 including continuously recirculating water or wastewater from the reactor into the open upper end of the flow channel and downwardly through the flow channel where the water or wastewater is discharged therefrom and thereafter moves upwardly in the reactor outside of the flow channel.
111. (New) The method of claim 107 wherein the agitator causes the water or wastewater passing through the flow channel to become at least slightly turbulent and to move downwardly in an axial flow pattern, and wherein the method entails engaging the

flow of water or wastewater being discharged from the flow channel and dividing the  
flow of water or wastewater being discharged from the flow channel.